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Jimomys labaughi, a New Geomyoid Rodent from the Early Barstovian of North America

JOHN H. WAHLERT[1]

ABSTRACT

Jimomys labaughi is a new genus and species of rodent of early Barstovian age. Morphology of the lower jaw, dentition, and incisor enamel indicates that the form is a geomyoid. The crown pattern of the cheek teeth appears to be derived independently from one primitive to the superfamily. A species from the John Day Formation, *Florentiamys lulli* (Wood, 1936), has similar tooth morphology and is transferred to *Jimomys*.

INTRODUCTION

In the course of curating the fossil rodents in the Frick Collection at the American Museum of Natural History (F:AM), jaws of a new rodent came to light. Eight were collected by Ted Galusha at Observation Quarry, Nebraska, a locality that has yielded a very diverse rodent fauna. One was collected by N. Z. Ward near Coldspring, Texas. Both faunas are of early Barstovian age. The jaws have a geomyoid appearance, but are not easily assigned to a specific family. No upper dentitions possibly associated have been identified.

I have benefited from the helpful comments of Drs. Mary R. Dawson, Malcolm C. McKenna, and Richard H. Tedford, and from the meticulous work of my assistant, Mrs. Jacqueline Tung. Mr. Otto Simonis prepared the specimens.

The scanning electron microscope photograph was taken by Mr. Robert J. Koestler on a Cambridge Scientific Instruments Model S-4 purchased by the Museum with funds granted by the National Science Foundation. Drawings were made with a Wild camera lucida microscope.

SYSTEMATICS

SUPERFAMILY GEOMYOIDEA WEBER, 1904, *INCERTAE SEDIS*

JIMOMYS, NEW GENUS

Type species. Jimomys labaughi,[1] new species.

Diagnosis. Small sciurognathous rodent with four brachyodont lower cheek teeth. Deciduous and permanent fourth premolars divided into three portions by two transverse sulci, molars into two equal portions by one transverse sulcus. Anterior and posterior portions enclose basins.

[1]For James M. Labaugh, musicologist (gh unvoiced in species name).

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Jimomys labaughi, new species
Figures 1a-f, 2

Type. F:AM 97816, partial left mandible with I-M_3.

Diagnosis. Same as for genus; larger than referred species, *J. lulli.*

Hypodigm. Nine partial mandibles are listed by locality. Observation Quarry, Dawes County, Nebraska: Type; F:AM 97817, left dP_4-M_1, alveoli M_{2-3}; F:AM 97818, left I-M_3; F:AM 97819, left I-P_4, alveloi M_{1-3}; F:AM 97820, right I-P_4, alveoli M_{1-3}; F:AM 97821, right I, dP_4-M_2; F:AM 97822, left I-M_2; F:AM 97846, left I, alveoli P_4-M_3. Trinity River Pit 1, San Jacinto County, Texas: F:AM 97825, left I-M_2.

Age. Early Barstovian.

Description. The mandible is slender and shallow. The diastema descends sharply from P_4 and curves up slightly to the incisor alveolus. The mental foramen is single and pierces the bone quite high a short distance anterior to the premolar. The masseteric fossa ends anterior to the linea obliqua in a depression under the anterior part of the premolar. The crista masseterica turns dorsally to form the anterior margin of the depression. The coronoid process arises lateral to M_2, and a channel separates it from the tooth row; the channel appears deepest and broadest in the oldest individual, F:AM 97818.

The incisor (fig. 1f) has no external ornament. The front and lateral sides form a smooth curve. The enamel extends about halfway around the lateral side; it has no significant overlap onto the mesial side. The wear facet is long, and the tooth is worn anteromesially to a rounded point. The incisor passes under the second molar so that P_4 and M_1 are external to it, M_3 internal. It terminates behind M_3 in a bulge on the outside of the jaw. The bulge is separated from the coronoid process by a slight trough.

The microstructure of the incisor enamel (fig. 2) is uniserial and very much like that in heteromyids and geomyids. The inner portion occupies about 19 percent of the total enamel thickness. It is quite different from the peculiar enamel I have found in the lower incisors of North American eomyids. In them the lamellar structure is rotated 90 degrees, and the enamel consists of three layers rather than the usual two. Description of this peculiar enamel is in progress.

The chief cusps of all the teeth stand only slightly higher than the crests connecting them. Posterior portions of each tooth contain a narrow basin restricted primarily to the lingual half of the tooth. Basins in the anterior portions are medially situated and longer; the anterior basin in P_4 is absent in some specimens; in M_3 it is mostly in the lingual half of the portion. Basins retreat lingually with wear.

The deciduous premolar is retained in two specimens. It is the same size as its replacement and has the same general crown morphology. The two roots are splayed far apart. The posterior transverse sulcus is deeper than the anterior one. The tooth in F:AM 97821 is so worn that the anterior and middle portions are joined on the labial side.

The permanent premolar is preserved unworn in three specimens, F:AM 97816 (type), 97819, and 97820. The anterior part of the tooth consists of protoconid, metaconid, and anteroconid in close association surrounding a shallow basin. The protoconid and metaconid stand slightly higher than the crest connecting them, and together they form a metalophid that is concave anteriorly. The anteroconid is low in the type and other specimens; it is absent and the basin lacking in two specimens, F:AM 97819 and 97825. The mesolophid, which is at the widest part of the tooth, is highest lingually and concave anteriorly. The posterior sulcus is shallowest lingually. The posterior portion of the premolar is made up of hypoconid, hypolophid, entoconid, and posterolophid surrounding a basin; the entoconid is the highest cusp. A slight constriction where the posterolophid meets the entoconid marks the outlet from the basin in unworn teeth.

The first and second molars are almost identical. The metaconid and metalophid form the anterior part of the tooth and are reduced so that the mesostylid and mesolophid are the dominant cusp and crest of the anterior portion. Both crests join the protoconid and border a syncline or, with wear, a basin. A constriction of the basin wall between the metaconid and mesostylid marks the former outlet; a similar constriction in the posterior portion occurs where the postero-

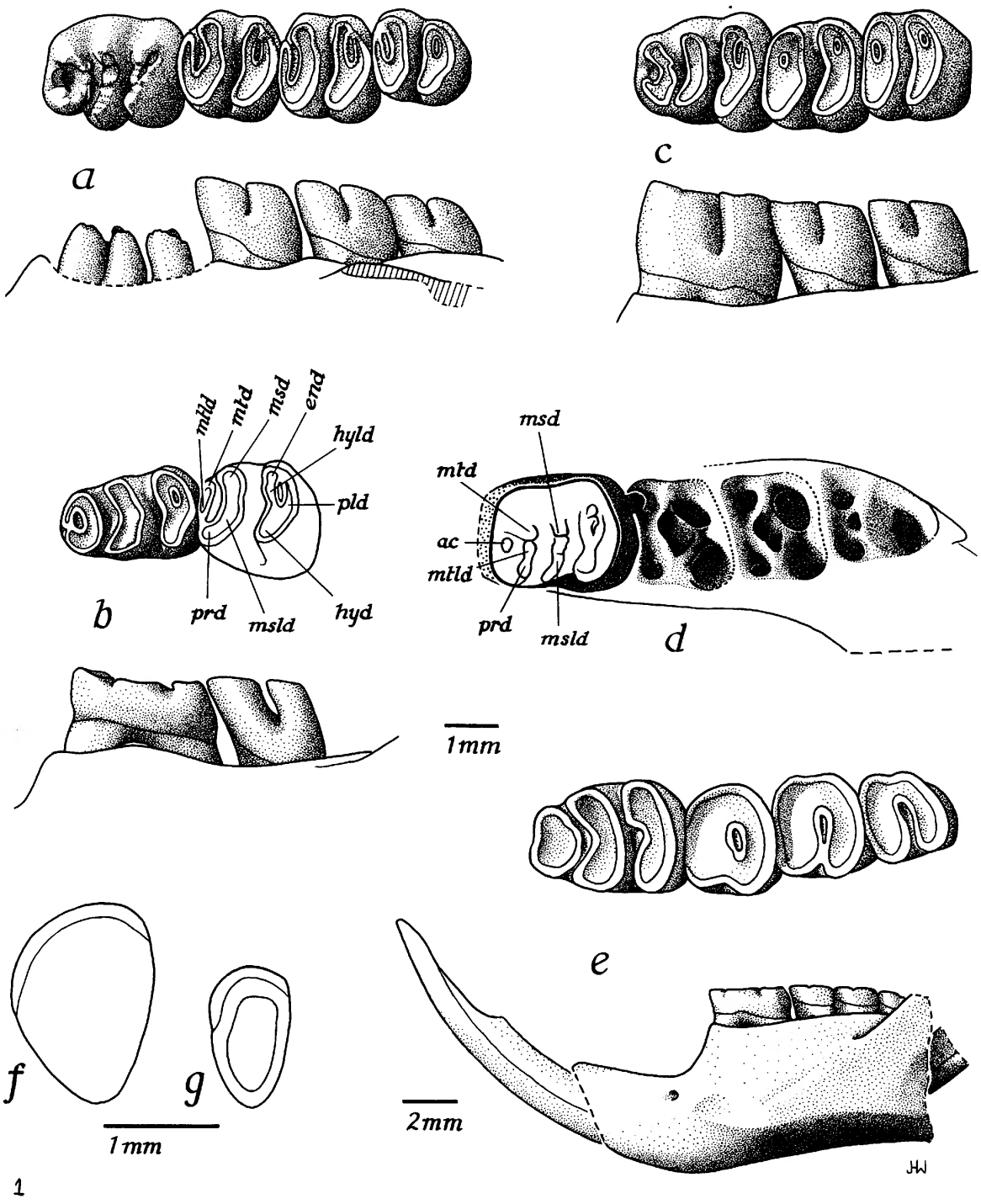

FIG. 1a-f. *Jimomys labaughi.* a. F:AM 97816 (type), crown and labial views. b. F:AM 97817, crown and labial views. c. F:AM 97822, crown and labial views. d. F:AM 97820, crown view (reversed). e. 97818, crown view of teeth and labial view of jaw. f. F:AM 97816, cross section of incisor. g. *Jimomys lulli*, YPM 10573, cross section of incisor (reversed).

Abbreviations. ac, anteroconid; end, entoconid; hyd, hypoconid; hyld, hypolophid; msd, mesoconid; msld, mesolophid; mtd, metaconid; mtld, metalophid; pld, posterolophid; prd, protoconid.

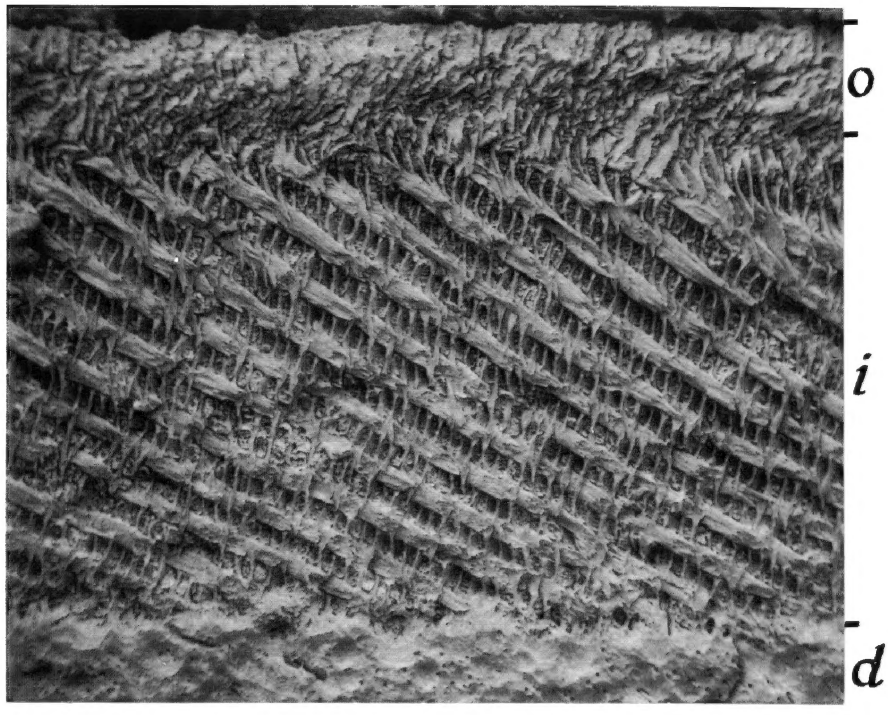

FIG. 2. *Jimomys labaughi*, sagittal section of incisor enamel. ×575. Tip of incisor is to the left.

Abbreviations: d, dentine; i, inner enamel layer; o, outer enamel layer.

lophid meets the entoconid. The crown could also be interpreted as lacking a mesostylid and mesolophid, the anterior portion thus comprised of anterolophid, protoconid, metalophid, and metaconid. However, the similarity in size and shape of the major crest with the mesolophid in the premolar, and the correspondence of crown morphology with that of *Pseudotheridomys hesperus*, discussed below, led me to adopt this system of labels.

The third molar is like the first two, except it is smaller, and the basin in the anterior portion is restricted primarily to the lingual half of the tooth. The sulcus in the molars is deeper labially than lingually. With extreme wear, as in F:AM 97818, the anterior and posterior portions have lost their basins and are united lingually; with further wear they unite labially and only a small lake in the middle remains of the sulcus. Teeth in this stage resemble those of *Cylindrodon*.

In cross section the anterior root of the premolar is round; the broad posterior root is kidney-shaped and convex posteriorly (F:AM 97846). In three specimens the alveoli of the molars are exposed. The first and second molars appear to have four roots. The anterior pair is smaller than the posterior, and the bone dividing the anterior pair stands considerably higher than that of the posterior. This suggests that the posterior roots were fused but had distinct tips. The third molar has two anterior roots and a single, large posterior one.

Measurements. Specimens were measured with a dial caliper to the nearest tenth of a millimeter. Transverse dimensions are the maximum width of each portion; jaws were held at the back and the caliper blades oriented parallel to the inclination of the portion being measured. Length was measured at the wear surface except in the premolars where the maximum dimension was used. The length of a cheek tooth is decreased by interdental wear and is age dependent. Diastemal length is the direct distance from the back of the incisor alveolus to the front of the alveolus of the first cheek tooth.

Discussion. Rodents are so varied with regard

to dentition that familial definitions must include a variety of other characters. Since only lower jaws of *Jimomys labaughi* are known, the basis for comparison is severely limited. The closest relatives of *Jimomys* must share certain of its characteristics: sciurognathous jaw, uniserial incisor enamel, molariform P_4, and lophate crown pattern. By Miocene time these have become primitive characters for several rodent groups. The hystricognathous-multiserial, and sciurognathous-pauciserial forms may be excluded from consideration, although the latter certainly characterized some distant ancestor. The derived characters, which may be shared with a close relative, are given in the generic diagnosis.

Most sciurids have a primitive crown pattern, and although they cannot be ruled out as relatives, there is no form known that is close to *Jimomys* in appearance. The castoroid and aplodontoid rodents are similar in having molariform and, especially in the latter, enlarged fourth premolars. But their crown patterns are too derived and unique to each of them for either to be considered a close relative. The cheek teeth of some theridomyoids resemble those of *Jimomys*, but the premolar is not divided into three portions.

The geomyoids remain for consideration. One among them is morphologically very close to *Jimomys*; this is the nearly contemporaneous eomyid, *Pseudotheridomys hesperus* (Wilson, 1960, pp. 73-75). In it the anterior and posterior parts of the cheek teeth are joined by a weak ectolophid which is cut through in P_4. The basins within each portion are wider than in *Jimomys* and not enclosed lingually even with wear. The mesolophid is long and united with the protoconid; in the first molar it curves anteriorly toward the metaconid. In P_4 it is weakly connected with the anterior portion of the tooth. The anterior cingulum is retained in P_4 and reduced or absent in the molars so that the metalophid forms the front of the tooth.

The morphology of the cheek teeth in *Pseudotheridomys* illustrates how a primitive myomorph crown pattern can be transformed to that seen in *Jimomys*. I have labeled the cusps and crests following Wilson (1960) on *Pseudotheridomys*. Since this genus shares with other eomyids a peculiar derived arrangement of enamel lamellae in the lower incisors, it cannot be an ancestor or close relative of *Jimomys*. I have assumed that the crown pattern of *Jimomys* is derived through homologous modification of the same primitive myomorph pattern.

TABLE 1
Measurements (in Millimeters) of *Jimomys labaughi*

	Sample Size	Type	Average	Observed Range
Diastemal length	5	5.5	5.3	4.8-5.6
Incisor width	6	1.2	1.1	1.0-1.3
depth	6	1.7	1.7	1.6-1.9
Alveolar length of check teeth	8	8.1	8.1	7.7-8.7
dP_4 ap	2	–	2.4	2.4-2.5
wa	2	–	1.2	1.1-1.2
wm	2	–	1.4	1.4-1.5
wp	2	–	1.6	1.6
P_4 ap	6	2.5	2.4	2.2-2.7
wa	5	1.5	1.4	1.3-1.5
wm	5	2.0	1.9	1.7-2.0
wp	5	1.8	1.9	1.8-2.1
M_1 ap	6	1.7	1.7	1.6-1.8
wa	6	1.9	1.9	1.8-2.0
wp	6	2.0	2.0	1.8-2.2
M_2 ap	5	1.7	1.6	1.5-1.7
wa	5	1.9	1.9	1.8-2.0
wp	5	2.0	2.0	1.8-2.2
M_3 ap	2	1.5	1.5	1.5
wa	2	1.6	1.6	1.6
wp	2	1.6	1.6	1.6

Abbreviations: ap, anteroposterior length; wa, wm, wp, width of anterior, middle, and posterior portions.

Eomyids, geomyids, and heteromyids are grouped in a superfamily, the Geomyoidea, that is placed in the suborder Myomorpha (e.g., cf. Wood, 1955a). The cheek teeth of Oligocene eomyids, especially of *Yoderimys*, closely resemble those of contemporary cricetids, a sister group in the superfamily Muroidea. The crown pattern of *Yoderimys* is the most primitive known for the Geomyoidea. The simpler patterns of geomyids and heteromyids must be derived from the same primitive pattern if the Geomyoidea is a natural group.

The deciduous and permanent premolars of *Jimomys* are less modified than the molars. The anterior part of the premolar is very similar to

that of *Yoderimys burkei* (Wood, 1955b, fig. 1a-c), and the entire tooth resembles the dP_4 of *Paradjidaumo* described by Black (1965, p. 28, fig. 4c). It differs considerably from heteromyid and geomyid premolars.

Extension of the masseteric fossa anterior to the linea obliqua is a characteristic of all the jaws of undescribed florentiamyines in the Frick Collection. This is anterior to the usual position in eomyids (e.g., cf. Black, 1965, figs. 4, 6). *Jimomys* appears to represent a lineage descended from a yet undiscovered geomyid or heteromyid with a primitive, eomyid-like dentition.

Florentiamys lulli Wood (1936, pp. 48-49) from the middle John Day beds of Bridge Creek, Oregon, is similar in crown morphology. The single specimen consists of M_{1-2} in a jaw fragment. The teeth are quite worn but show significant details. The molars are low-crowned; a transverse sulcus divides them into two equal portions. The remnant of a basin appears in the lingual halves of both portions of M_1 and in the anterior portion of M_2; Wood stated that this indicates the presence of well-developed anterior and posterior cingula, and he placed the species in the genus *Florentiamys*. I doubt, however, that the teeth of *Florentiamys* itself would wear to this pattern and see no evidence for the enclosure of similar basins in *Sanctimus* or other related florentiamyines in the Frick Collection. The two portions are joined on the labial side of the middle due to extreme wear. Wood termed this an "H-pattern." In *Jimomys labaughi* union occurs first on the lingual side of the tooth after all trace of the basins is gone. The coronoid process of *F. lulli* stands free from the jaw lateral to M_2. Not enough of the masseteric fossa remains for useful comparison. The incisor is more nearly parallel-sided (fig. 1g); it measures 0.7 mm. wide and 1.2 mm. deep. With reservation, I transfer the species to the new genus as *Jimomys lulli* (Wood).

Conclusions. Jimomys labaughi is a geomyoid rodent. The crown pattern of its cheek teeth, especially that of the premolar, indicates derivation from a form more primitive than any known geomyid or heteromyid. The structure of the incisor enamel and extent of the masseteric fossa show affinity of the genus to these two families and demonstrate that it is not an eomyid. A specimen from the John Day Formation, *Jimomys lulli*, extends the range of the genus back into the Arikareean and adds support to the hypothesis of a separate lineage.

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